LETTERS TO THE EDITOR.

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The Extirpation of the Tsetse-fly: a Correction and a Suggestion.

IN my letter published in NATURE of October 25 on the breeding haunts of the tsetse-fly discovered by Dr. Bagshawe, I stated that there were no banana plantations on the deserted island of Kimmi, on the Victoria Nyanza, and suggested that the flies there must have some other breeding-places than the plantations. I am informed, however, by my friend and colleague Lieut. A. C. H. Gray, R.A.M.C., who has just started for Uganda, that he and the late Lieut. F. M. G. Tulloch, when collecting flies on Kimmi, came across deserted banana plantations, overgrown by the forest and bearing ripe bananas (a sure sign that no natives visit them or know of them). I must correct, therefore, my former statement.

If the banana plantations should prove to be the sole or principal breeding-place of the tsetse-fly, the question at once arises, what means could be taken to exterminate the fly or check its increase? To destroy the plantations would be impossible, as I have said, because the banana is the staple food of the country. I venture to suggest that an efficient means of keeping down the tsetse-fly would be to encourage or constrain the natives to keep fowls in their plantations in places where the fly is abundant. These birds would scratch up and discover the pupæ much quicker than a man could, and would probably devour them greedily when found. In forest districts it might be seriously considered whether it would not be advisable to introduce the Indian jungle-fowl for the same purpose. It is, of course, always a risky thing to introduce exotic wild species into a country, but the jungle-fowl, being a valuable game-bird, could hardly be a serious nuisance, however much it multiplied.

I would suggest, further, that a most suitable place in which to try experiments on the extirpation of the fly would be the island of Kimmi already mentioned. Within easy reach of Entebbe, uninhabited, covered with forest or jungle, and swarming with tsetse-flies, it is a locality in which it would be very easy to introduce the jungle-fowl and to watch the effects. As there are no monkeys, so far as I am aware, on the island, the fowl would probably be able to flourish and multiply unchecked. Such an experiment, even if it failed to produce the desired effect, could do no harm, and if it succeeded would be of very great importance. E. A. MINCHIN.

Lister Institute of Preventive Medicine, November 2.

The Efficiency of the Present Process of Natural Indigo Manufacture.

IN NATURE of September 20 (vol. lxxiv., p. 526) I find mention of a paper read before Section B at the recent meeting of the British Association by Mr. W. Popplewell Bloxam, on a new method of determining indigotin. It is stated that "the author concludes that the present process of manufacture is a wasteful one, the highest efficiency attained not reaching 50 per cent., whilst on the average only 25 per cent. of the indigotin in the leaves is extracted."

In justice to the indigo-planting community in India, I think this statement should not go unchallenged. The grounds on which Mr. Bloxam draws his conclusion are not given in the brief *resumé* of his paper in NATURE, and I am therefore obliged to seek an explanation in his communication to the Journal of the Society of Chemical Industry of August 15 on the same subject, in which a similar statement of the low efficiency of the indigo-manufacturing process is made. In this paper Mr. Bloxam gives the analysis obtained by his new method of the indigo turned out each day during the manufacturing season at a certain factory in Bihar. From the figure so obtained, and the total daily outturn of finished indigo recorded in the factory "mahai" book, he calculates the amount of indigotin produced day by day, and from the proportion existing between the amount so calculated and the amount theoretically obtainable, deduced from the weight of green plant placed in the vat and *the assumption that this plant contains 0·6 per cent. of indigotin*, he arrives at his estimate of the efficiency of the manufacturing process.

Now it is clear that in this method of calculation error may occur in the following particulars:—

(1) The analysis of the finished indigo.

(2) The weighment of the daily outturn of finished product.

(3) The weighment of the green plant.

(4) The assumed content of indigotin in the green plant.

The first point is one for discussion elsewhere. It is sufficient for my present purpose to point out that the average of Mr. Bloxam's results (60 per cent. indigotin) agrees substantially with the average quality usually accepted as typical of Bihar indigos, and that, therefore, his results probably do not differ very widely from the truth. The same cannot be said of the second point. Separate weighment is hardly ever made of the daily outturn of an indigo factory, and I know as a fact that this was not done in the case on which Mr. Bloxam bases his figures. A rough estimate of the outturn is arrived at by measurement of the cakes produced in a wet condition, and the result obtained generally falls short of the actual production by 10 per cent. to 30 per cent. Mr. Bloxam must therefore have obtained his figures from cake measurement—at best a very inaccurate proceeding.

Similar inaccuracies occur in the weighment of the green plant in the ordinary factory routine; but the culminating error on which Mr. Bloxam's figures are based occurs in his assumption of 0·6 per cent. as the amount of indigotin occurring in the green plant. It has been my privilege to serve the indigo planters in Bihar in a scientific capacity for nearly five years. During this time I have carried out some hundreds of analyses of indigo plants of all varieties, ages, and sizes, and in only one or two cases has so high an indigotin content as Mr. Bloxam assumes is normal been recorded. These were in cases of the Java plant (*Ind. arrecta*, which contains an exceptional amount of indigotin, and was only being cultivated on a small scale during the season from which Mr. Bloxam's conclusions are drawn) under peculiar conditions of manuring. It would be more accurate to place the average indigotin content of the plant used during the season quoted by Mr. Bloxam at 0·3 per cent., so that his estimate of the efficiency of the manufacturing process should be doubled.

As a matter of fact, recent work, carried out with attention to the details I have enumerated, has shown that the process may with care, but with no modification other than is available to every planter, be rendered as efficient as 70 per cent. to 80 per cent., and that as it is carried out by the average planter it seldom falls below 60 per cent. C. BERGTHEIL.

The Research Station, Sirsiah, Mozufferpore, India, October 10.

The Leonid Meteors.

THOUGH the Leonid epoch of 1905 does not seem to have been marked by a great abundance of shooting stars, a magnificent aurora having unexpectedly taken the place on the evening of November 15 of the shower anticipated later on that night, yet it is probable that in the absence of moonlight and cloud the radiant in Leo would have been found to be more active than seemed to be the case. The phase of the moon renders the conditions for good observations more favourable in the present year, and it is probable that if the weather during the critical period turns out fine, Leonids will be observed in considerable numbers. In 1906 these meteors become due on the night of November 15. The anticipated display is connected by the nineteen-year period with the shower of November 14, 1868, and, like the latter, will be visible over both Europe and America. As calculated by the writer, the principal maxima take place on November 15 at 12h. 45m., 14h., 19h., and 21h. 40m., G.M.T. These maxima will therefore occur on the morning of November 16, the first two being visible here, while the remaining two, which repre-

sent by far the stronger portion of the shower, will fall to the lot of American observers.

The calculated intensity of the shower is rather inferior to that of its prototype of 1868; besides, the first maxima fall early in the night, and may not, therefore, be seen at their best. Nevertheless, the present epoch is a well-defined one, and should yield satisfactory returns to the vigilance of meteor observers.

Of the minor showers associated with the period, the most interesting occur on November 16 between 13h. and 14h., and on November 17 from 13h. to 18h.

Dublin. JOHN R. HENRY.

The Rusting of Iron.

IN reference to the discussion on the rusting of iron in recent numbers of NATURE, I happen to have a curious specimen illustrating the accumulating of rust which may possibly be of some little scientific value. It is a horse-shoe which was dug up some years ago by a child out of the sand on the site of the battle of Prestonpans, near Edinburgh. It was given me by the child's father, who was with him at the time. The shoe is now very irregular and lumpy. The thickness of the naked iron can be made out at one spot, where it is partially denuded. It is just three-eighths of an inch. But with the mass of what I can only describe as rust, and, I presume, sand—some small pebbles are, too, imbedded in it—it is in one spot as thick as 2 inches, and in girth it there measures $6\frac{3}{8}$ inches. No part of it is wholly clear of rust; the smallest girth is 4 inches.

The famous battle was fought on September 21, 1745, and the supposition is that the shoe, if not the horse, was lost there. The supposition is probable enough. If correct, the rust would represent the accumulation in a century and a half. I may add that I have some specimens of pig-iron which were turned out at foundries here fifty years ago, and have been in the open air ever since. They have just a brown coat, but the coat is of no perceptible thickness.

JOSEPH MEEHAN.

Creevelea, Drumkeeran, October 29.

PROTOZOA AND STATOZOA.[1]

THE late publication of the first volume of this well-known series has enabled the authors to incorporate some of the results of the more recent researches upon their several subjects. Taken in conjunction with the earlier published volumes, the work seems to fulfil the purpose of providing an intelligible and adequate survey of the entire animal kingdom without giving undue prominence to particular groups.

Prof. Hartog's share in the work makes a well-timed appearance in the year which has witnessed something like a crisis in the history of protozoology. His chapters are full of suggestive comparisons and analogies, and their value is increased by the addition of copious footnotes. Some of the statements are not supported by references, as, for example, where he speaks of the presence of a contractile vacuole in the zoospores of algæ and fungi without mentioning any specific instances of this condition (p. 15).

The essential complexity of the simplest manifestations of living matter is made evident, and Prof. Hartog does not harmonise the vitality of protoplasm with the vagaries of a drop of oil or of a bubble. The segmentation of the oosperm of Metazoa and Metaphyta is compared with the sporulation of the Protista, both phenomena being characterised as brood-formations (p. 31).

In the second chapter the author begins with an interesting disquisition on the old belief in spontaneous generation as an explanation of the origin of the organisms of putrefaction, pointing out how this was due in part to the supposed inconstancy of species in Protista, and that this in turn resulted from the want of knowledge of their life-histories; how this knowledge was supplied in the first place by the Rev. W. H. Dallinger and Dr. Charles Drysdale for Protozoa, and for the Protophyta by F. Cohn and later by von Koch, who perfected the methods of culture devised by De Bary for the study of the fungi.

In his remarks on reproduction by syngamy, Prof. Hartog distinguishes between exogamy and endogamy, the rhizopod Trichosphærium affording an example of the exogamous conjugation of biflagellate isogametes, while the heliozoan Actinosphærium practises endogamy.

Referring to the pelagic foraminifer Globigerina (p. 61), the author says that after death the tests sink to the bottom of the sea to form the "Globerina ooze" (*sic*), "at depths where the carbonic acid under pressure is not adequate to dissolve the more solid calcareous matter." On the following page we read:—"Some Foraminifera live on the sea bottom

FIG. 1.—*Cerianthus membranaceus* in its tube. Colour pink, with tentacles annulated pink and brown. About 35 cm. in length. From "The Cambridge Natural History," vol. i.

even at the greatest depths, and of course their shell is not composed of calcareous matter." There is nothing to indicate to the reader why this is more obvious than any of the other plain statements in the book.

The last three chapters of Dr. Hartog's treatise deal with the Sporozoa, the Flagellata, the Ciliata, and the Suctoria. As an illustration of the rapid strides of recent years, he notes that seven years ago no single species of Sporozoa was known in its complete life-cycle. It would have been better to have used the general expression "body-cavity" instead of "cœlom" on p 105. Cœlom and hæmocœl are both body-cavities, just as clothes props and thoroughbreds are both horses!

The importance of investigations into the life-

[1] "The Cambridge Natural History." Vol. i. Protozoa. by Prof. Marcus Hartog; Porifera (Sponges), by Igerna B. L. Sollas; Cœlenterata and Ctenophora, by Prof. S J. Hickson, F.R.S.; Echinodermata, by Prof. E. W. MacBride, F.R.S. Pp. xvii+671; illustrated. (London: Macmillan and Co., Ltd., 1906.) Price 17s. net.